WHAT IS CLAIMED IS:

1. A plasma processing apparatus comprising:

a chamber in which a plate to be processed is contained;

an introductory port via which a hydrogen-atom-containing gas is guided into the chamber;

a lower electrode on which the plate to be processed is laid in the chamber;

an upper electrode which is disposed opposite to the lower electrode and which causes electric discharge in the chamber to produce a plasma;

a power supply which supplies voltage between the lower electrode and the upper electrode; and

a metal oxide structural body disposed in a part in the chamber, the metal oxide structural body being reduced when the hydrogen-atom-containing gas is introduced.

2. The plasma processing apparatus according to claim 1, wherein the metal oxide structural body includes one selected from the group consisting of Cu oxide and Ag oxide on at least the surface of the metal oxide structural body.

3. The plasma processing apparatus according to claim 1, wherein the surface of the metal oxide structural body is coated with one selected from the group consisting of Cu and Ag.

4. The plasma processing apparatus according to

claim 1, wherein the metal oxide structural body is disposed in a position in the vicinity of the plasma and in the position out of ion irradiation from the plasma.

5. The plasma processing apparatus according to claim 1, wherein the metal oxide structural body is disposed in a ring shape on the inner surface of the chamber.

6. The plasma processing apparatus according to claim 1, wherein the metal oxide structural body is disposed in a cylindrical shape on the inner surface of the chamber.

7. The plasma processing apparatus according to claim 1, wherein the hydrogen-atom-containing gas, which is to be guided into the chamber, includes at least one selected from the group consisting of H_2, NH_3, and CH_4.

8. The plasma processing apparatus according to claim 1, wherein the plate to be processed is obtained by forming a pattern of a resist on a low dielectric constant film and using the resist pattern as a mask to selectively etch the low dielectric constant film, and the plasma produced between the lower electrode and the upper electrode ashes the resist.

9. The plasma processing apparatus according to claim 1, wherein the power supply is a high-frequency power supply.

10. A plasma processing apparatus comprising:

a chamber in which a plate to be processed is contained;

an introductory port via which a predetermined gas is guided into the chamber;

a lower electrode on which the plate to be processed is laid in the chamber;

an upper electrode which is disposed opposite to the lower electrode and which causes electric discharge in the chamber to produce a plasma;

a power supply which supplies voltage between the lower electrode and the upper electrode; and

a light emitting monitor which monitors intensity of emission by hydrogen atoms in the plasma in the chamber.

11. The plasma processing apparatus according to claim 10, wherein the predetermined gas to be guided into the chamber includes at least one selected from the group consisting of H_2, NH_3, CH_4, and O_2.

12. The plasma processing apparatus according to claim 10, wherein the plate to be processed includes a low dielectric constant film, and a resist pattern disposed on the low dielectric constant film to selectively etch the low dielectric constant film, and the plasma produced between the lower electrode and the upper electrode ashes the resist.

13. The plasma processing apparatus according to

claim 10, wherein the power supply is a high-frequency power supply.

14. A plasma processing method comprising:

guiding a predetermined gas into a chamber in which a plate to be processed including a resist pattern on the surface is contained;

producing a plasma by electric discharge in the chamber;

ashing the resist pattern of the plate to be processed; and

monitoring a fluctuation of emission intensity of hydrogen atoms from an initial state with a photo sensor in order to detect a fluctuation of an ashing rate of the resist or a cleaning timing of the chamber.

15. The plasma processing method according to claim 14, wherein the predetermined gas to be guided into the chamber includes at least one selected from the group consisting of H_2, NH_3, CH_4, and O_2.

16. The plasma processing method according to claim 14, wherein the monitoring of the fluctuation of the emission intensity of the hydrogen atoms with the photo sensor comprises using the photo sensor having a sensitivity to a wavelength of 656 nm.

17. The plasma processing method according to claim 14, further comprising:

forming the resist pattern on a low dielectric constant film; and

using the resist pattern as a mask to selectively etch the low dielectric constant film so that the plate to be processed is obtained,

wherein the ashing of the resist pattern of the plate to be processed comprises ashing the resist pattern on the low dielectric constant film.

18. A semiconductor manufacturing apparatus comprising:

a chamber in which a semiconductor wafer as an object of resist ashing is contained;

an introductory port via which a hydrogen-atom-containing gas is guided into the chamber;

a lower electrode on which the semiconductor wafer is laid in the chamber;

an upper electrode which is disposed opposite to the lower electrode and which causes electric discharge in the chamber to produce a plasma;

a power supply which supplies voltage between the lower electrode and the upper electrode; and

a metal oxide structural body disposed in a part in the chamber, the metal oxide structural body being reduced when the hydrogen-atom-containing gas is introduced.

19. The semiconductor manufacturing apparatus according to claim 18, wherein the metal oxide structural body includes one selected from the group consisting of Cu oxide and Ag oxide on at least the

surface of the body.

20. The semiconductor manufacturing apparatus according to claim 18, wherein the semiconductor wafer includes a low dielectric constant film formed above the semiconductor substrate, and a resist disposed on the low dielectric constant film in order to selectively etch the low dielectric constant film, and the plasma produced between the lower electrode and the upper electrode ashes the resist.